

FORM 2.7 HAUL ROAD FUGITIVE EMISSIONS WORKSHEET

Facility Name		FIPS County No.		Plant No.	Year of Data
***** PLEASE NOTE ***** If the sum of all Vehicle Miles Traveled (VMT) for all haul roads and trucks is less than 100 VMT, then the PM10 emissions for all the haul roads do not need to be reported on these forms. However, if the emissions are not reported, documentation on the actual annual VMT figures for the facility must be provided.					
[1] HAUL ROAD INFORMATION					
Point No.	AIRS ID-Pt	SCC	Seg No.	Type of Dust Control (Check One)	Control Eff %
Length of Road (Miles)	Silt Content (%) <small>(Default = 8.3 %)</small>	Surface Material of Road		<input type="checkbox"/> Surfactant Spray	90
				<input type="checkbox"/> Water Spray Documented	
Surface Material Moisture Content (%) <small>(must reference dry, worst-case conditions) (Default = 0.2 %)</small>		Days of Rain with at least 0.01" per Year <small>(Default = 105 Days)</small>		<input type="checkbox"/> Water Spray	50
				<input type="checkbox"/> No Controls	
				<input type="checkbox"/> Other (Specify)	
[2] HAUL TRUCK INFORMATION					
Make/Model			Unloaded Truck Wt (Tons)		
Average Wt of Material per Load (Tons)			Average Loaded Truck Wt (Tons)		
Average Truck Speed (MPH)					
[3] MATERIAL HAULED					
Type of Material(s) Hauled			List any permit conditions limiting the amount hauled.		
Annual Amount Hauled (Tons)			Maximum Hourly Amount Hauled (Tons)		
[4] CALCULATION OF ANNUAL VEHICLE MILES TRAVELED (VMT)					
ANNUAL VMT = $2 \times \{\text{Length of Haul Road}\} \times \{\text{Annual Amount Hauled}\} / \{\text{Average Wt of Material per Load}\}$					
Annual VMT		Reportable Level = the Sum of all Road VMTs > 100		Maximum Hourly VMT	
[5] Calculation of Haul Road Emission Factor					
PM10 EMISSION FACTOR = $2.6 \times \{(\text{Silt Content} (\%)) / 12\}^{0.8} \times \{[(\text{Unloaded Truck Wt}) + \{\text{Average Loaded Truck Wt}\} / 6]^{0.4} \times [(365 - \{\text{Days of Rain}\}) / 365] / [(\text{Surface Material Moisture Content} (\%)) / 0.2]^{0.3}$ * If Average Truck Speed is < 15 (MPH), multiply the equation by (Average Truck Speed / 15)					
PM10 Emission Factor					
Lbs PM10 / VMT					
<p>The PM10 emission factor for the haul roads can be calculated using the equation from the AP 42 section on Unpaved Haul Roads (Section 13.2.2) provided in Block 5 of this worksheet. When using these equations, PM10 emission factors should be calculated for each separate haul road and type of haul truck. The Stone Quarrying SCC number (3-05-020-11) should be used as the SCC number on Form 2.0. The calculated PM10 emission factor should be entered in the PM10 Box in Block 7 on Form 2.0.</p> <p>A more detailed discussion on dust control method and the the resulting Control Efficiency (%) can be found in the AP 42 Section 13.2.2. The appropriate dust control method should be checked in Block 1 and the control efficiency should be entered in the PM10 box of Block 9 on Form 2.0.</p>					
ALTERNATE METHODS TO ESTABLISH THE HUAL ROAD PM10 EMISSION FACTOR					
Instead of using this form to calculate the PM10 emission factor for haul roads, the Source Classification Code (SCC) for Stone Quarrying and Processing Haul Road Emissions (3-05-020-11) may be used as a default SCC number. The PM10 emission factor to use with this SCC number is 6.2 Lbs of PM10 per VMT.					

INSTRUCTIONS

FORM 2.7 HAUL ROAD FUGITIVE EMISSIONS WORKSHEET

This form is **REQUIRED** if a facility must calculate the emission factor(s) from one or more unpaved haul roads located on the facility site. If the Form 2.7 is not used to calculate an emission factor, the company still needs to show how they calculated their Annual VMT.

Use Form 2.7 to derive an emission factor for each haul road activity, according to each industry's SIC (Standard Industrial Classification). If you decide to use Form 2.7 to derive your own emission factors for a haul road, the following instructions apply:

Use a separate Form 2.7 for each haul road and each vehicle type if capacities of the haul trucks vary.

You may group separate haul roads as one point if certain conditions are met:

- a) The physical characteristics of the roads and trucks are so similar that if separate emission factors were calculated, the results would be the same.
- b) Truck and road characteristics are so different that calculation of emission factors would yield different results for the different roads. In this case, the reported emission factor is the weighted average of the factors for each road. These emission factors are "weighted" by the VMT.

Example: Suppose a facility has haul roads with VMTs of 1,000, 1,200, and 1,800 miles, respectively. The facility wishes to group and report the haul roads as one point. Further, assume the PM_{10} emission factors have been calculated to be 3.0, 3.2, and 2.1 lbs. PM_{10}/VMT , respectively.

3.0 lbs. x 1000 VMT = 3,000 lbs.

3.2 lbs. x 1200 VMT = 3,840 lbs.

2.1 lbs. x 1800 VMT = 3,780 lbs.

Totals 4000 VMT 10,620 lbs.

10,620 lbs. $PM_{10} \div 4,000 \text{ VMT} = 2.655 \text{ lbs. } PM_{10}/VMT$.

Report the appropriate factor on Form 2.0 for the combined haul roads.

Complete **Facility Name**, **FIPS County Number**, **Plant Number** and **Year of Data**.
See Form 1.0 instructions, page 1.0-1.

1) HAUL ROAD INFORMATION

Point Number: This number is the unique identification number for each specific haul road. This identification number must match the point number entered on Form 1.1, Process Flow Diagram, Form 1.2, Summary of Emission Points and Form 2.0, Emission Point Information.

Length of Road: Report the length of the haul road to the nearest tenth of a mile.

Silt Content: Enter the Silt Content of the road surface, if known. Obtain the Silt Content by measuring the proportion of loose, dry surface dust that passes a 200 mesh screen, using ASTM-C-136 method. Table 13.2.2-1 at the end of this instruction set lists some typical Silt Content values. A default value of 8.3 percent may be used for the Silt Content of the road surface if no other information is available.

The PM_{10} emission factor equation of Section [5] requires that the Silt Content be entered as a percent, not the decimal equivalent. Example: If the default value of 8.3% is selected, enter as 8.3 not .083 in the formula.

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Haul Road Fugitive Emissions Worksheet
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Surface Material of Road: Enter the type of material that makes up the road surface.

Surface Material Moisture Content of Road: Enter the moisture content of the material that makes up the road. Determining road surface silt and moisture contents are given in AP-42 Appendices C.1 and C.2. It is emphasized that the moisture content to be used in the PM₁₀ emission factor of Section [5] **must reference dry, worst-case conditions**. If the default value of 0.2% is selected, enter 0.2 not .002 in the equation.

Days of Rain with at least 0.01 Inches per Year: Enter the number of days of rain if this information is available. The default value of 105 days is the recommended value unless other specific information on the number of days of rain is available.

Type of Dust Control: Check the appropriate box for any control measures that are adequate to reduce the amount of dust released and used every working day when it does not rain. Enter the dust control method and efficiency in the appropriate boxes in Block [3] on Form 2.0, Emission Point Information.

2) **HAUL TRUCK INFORMATION**

If more than one haul truck is used on the same haul road, attach a page to this form that indicates the following information for each additional haul truck used.

Make/Model of Truck: Enter the Make and Model for this specific haul truck.

Unloaded Truck Weight (in Tons): List the weight of this specific haul truck when empty.

Average Weight of Material Per Load (in Tons): Enter the average weight of the haul truck per load. Calculate this figure by subtracting the Unloaded Truck Weight from the Average Loaded Truck Weight.

Average Loaded Truck Weight (in Tons): Enter the Unloaded Truck Weight plus the average amount of material that this specific haul truck hauls at one time.

Average Truck Speed (in Mph): Enter the Average Speed of the haul truck when it is loaded.

3) **MATERIAL HAULED INFORMATION**

Type of Material Hauled: Enter the type of material normally hauled. Some examples are gravel, fines, slag, rip rap, etc.

List Any Permit Condition Limiting the Amount Hauled: If a permit issued by an air pollution control agency has a condition limiting the amount of material hauled during the year, then report the permitted amount of material that can be hauled in this box.

Annual Amount Hauled (in Tons): Report the annual amount of material that the specific haul truck associated with this emission point hauled.

Maximum Hourly Amount Hauled: Report the maximum theoretical amount of material that this specific haul truck could haul per hour if operated every day for the entire year.

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Haul Road Fugitive Emissions Worksheet
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An alternative method to calculate the Maximum Hourly Amount Hauled is to divide the maximum amount hauled by the total annual hours of operation.

4) **CALCULATION OF ANNUAL VEHICLE MILES TRAVELED (VMT)**

Annual VMT: This figure for the Annual VMT is a calculated number and is not based on odometer readings for the specific haul truck. The formula to calculate the Annual VMT is:

$$\text{Annual VMT} = 2 \times (\text{Length of Haul Road}) \times (\text{Annual Amount Hauled}) \\ + (\text{Average Weight of Material per Load})$$

Perform the Annual VMT calculation for this haul road and haul truck and enter the results. The Annual VMT units will be miles traveled.

NOTE: If the sum of all the Annual VMT Miles for all haul roads and haul trucks is less than 100 Annual VMT traveled for the entire facility, then the emissions do not need to be reported on a Form 2.0 for purposes of calculating an emissions fee. If the sum of the Annual VMT is less than 100 VMT, additional documentation should be provided to verify the actual amount of the VMT figure.

Maximum Hourly VMT: The formula to calculate the Maximum Hourly Design Rate (MHDR), is $[2 \times (\text{Length of Haul Road}) \times (\text{Maximum Hourly Amount Hauled})] / (\text{Average Weight of Material per Load})$.

5) **CALCULATION OF HAUL ROAD EMISSION FACTOR**

Block 5 provides an equation from the AP-42 section on Unpaved Roads (Sec. 13.2.2) to calculate the PM₁₀ emission factor. The PM₁₀ Emission Factor for each haul road and specific haul truck is a calculated number. The figure can be calculated using the formula presented below:

$$\text{PM}_{10} \text{ Emission Factor} = \\ 2.6 \times \{ \text{Silt Content (\%)} / 12 \}^{0.8} \times [\{ \text{Unloaded Truck Wt} \} + \{ \text{Average} \\ \text{Loaded Truck Wt} \} / 6]^{0.4} \times [(365 - \{ \text{Days of Rain} \}) / 365] / [\{ \text{Surface} \\ \text{Material Moisture Content (\%)} \} / 0.2]^{0.3}$$

* If average truck speed is < 15 (mph), multiply the above equation by (average speed / 15)

Calculate the PM₁₀ **Emission Factor** for this specific haul road and enter the results. The units on the emission factor are pounds of PM₁₀ emitted per VMT.

Example: Assume average truck speed is 10; unloaded truck weight is 15 tons; average loaded truck weight is 30 tons; use default values of 8.3 for silt content, 105 for days of rain and 0.2 for surface material moisture content.

$$2.6 \times [8.3 / 12]^{0.8} \times [(15 + 30) / 6]^{0.4} \times [(365 - 105) / 365] / [0.2 / 0.2]^{0.3} \times (10 / 15)$$

$$2.6 \times 0.74 \times 2.24 \times 0.71 \times 1 \times 0.67 = 2.05 \text{ lbs PM}_{10} / \text{VMT}$$

Instructions for Form 2.7

Haul Road Fugitive Emissions Worksheet

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ENTER THE FOLLOWING ON FORM 2.0, EMISSION POINT INFORMATION:

- Block 1 - If a more specific SCC cannot be located, use the Stone Quarrying SCC number 3-05-020-11;
- Block 4 - Annual VMT is the Annual Throughput; units will be VMT, not tons.
- Block 7 - Enter the PM₁₀ Haul Road Emission Factor.
- Block 9 - The applicable efficiency listed under the heading "Type of Dust Control" may be entered in the PM₁₀ box. Higher control efficiency for watering of haul roads will be allowed provided appropriate records are kept.

Table 13.2.2-1. TYPICAL SILT CONTENT VALUES OF SURFACE MATERIAL
ON INDUSTRIAL AND RURAL UNPAVED ROADS^a

Industry	Road Use Or Surface Material	Plant Sites	No. Of Samples	Silt Content (%)	
				Range	Mean
Copper smelting	Plant road	1	3	16 - 19	17
Iron and steel production	Plant road	19	135	0.2 - 19	6.0
Sand and gravel processing	Plant road	1	3	4.1 - 6.0	4.8
	Material storage area	1	1	-	7.1
Stone quarrying and processing	Plant road	2	10	2.4 - 16	10
	Haul road to/from pit	4	20	5.0-15	8.3
Taconite mining and processing	Service road	1	8	2.4 - 7.1	4.3
	Haul road to/from pit	1	12	3.9 - 9.7	5.8
Western surface coal mining	Haul road to/from pit	3	21	2.8 - 18	8.4
	Plant road	2	2	4.9 - 5.3	5.1
	Scraper route	3	10	7.2 - 25	17
	Haul road (freshly graded)	2	5	18 - 29	24
Construction sites	Scraper routes	7	20	0.56-23	8.5
Lumber sawmills	Log yards	2	2	4.8-12	8.4
Municipal solid waste landfills	Disposal routes	4	20	2.2 - 21	6.4
Publicly accessible roads	Gravel/crushed limestone	9	46	0.1-15	6.4
	Dirt (i.e., local material compacted, bladed, and crowned)	8	24	0.83-68	11

^aReferences 1,5-16.